

## Impact of Biological Control Insects on Yellow Starthistle at One Site in Yolo County

D. M. Woods, D. B. Joley, M. J. Pitcairn, and V. Popescu

Biological control of weeds is an inherently long-term process requiring a sustained commitment to post-release monitoring to demonstrate successes and impacts. In 1993, we set up three sites where we could conduct long-term evaluations of the success of biological control on yellow starthistle. This report presents a preliminary look at data collected from one of those three sites. The site is former pastureland west of Woodland California, in Yolo County. Five seedhead attacking insect species were released from 1993 to 1995, and all five species established to varying degrees. They included three weevils, *Bangasternus orientalis* (Capiomont) (Coleoptera: Curculionidae), *Eustenopus villosus* (Boheman) (Coleoptera: Curculionidae), and *Larinus curtus* Hochhut (Coleoptera: Curculionidae), the gall fly, *Urophora sirunaseva* (Hering) (Diptera: Tephritidae), and the false peacock fly, *Chaetorellia succinea* (Costa) (Diptera: Tephritidae). Details of the releases and research methods were presented in earlier reports and are not repeated here.

Attack rates on seedheads have increased progressively over several years, reaching over 70% in the most recent two years (Figure 1). The weevil, *E. villosus*, accounts for the largest proportion of this attack. Seed destruction is the primary direct effect of the seedhead-feeding agents, although the hairy weevil also causes dramatic mortality to flower buds prior to seed production. Seed destruction measures began in 1995, one to two years after the agents had been released but while attack rates were still at low levels. Beginning in 1997, the first declines in seed production were evident (Figure 2). Seed production per seedhead has remained low since that time. Additionally, with a progressive decline in yellow starthistle plant numbers (Figure 3), the total seed production for the site has decreased even more rapidly.

Plant height and density are the most visible factors affecting the public's view of a successful control program. Although plant height was not measured in this study, the progressive decline in plant numbers associated with increases in both the population of biological control insects and the amount of seed destruction suggests that successful long-term control is probably occurring at this site.

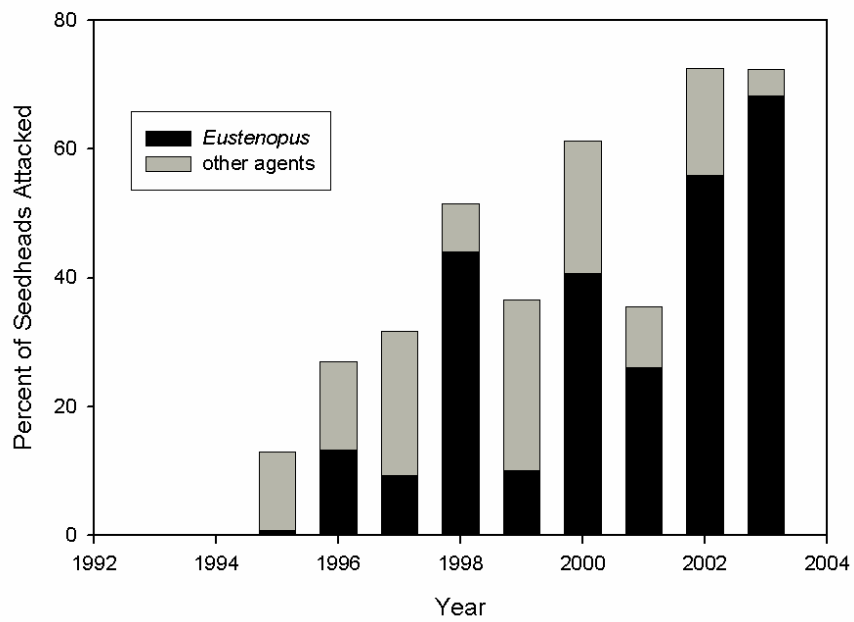


Figure 1. Attack of yellow starthistle seedhead by biological control insects

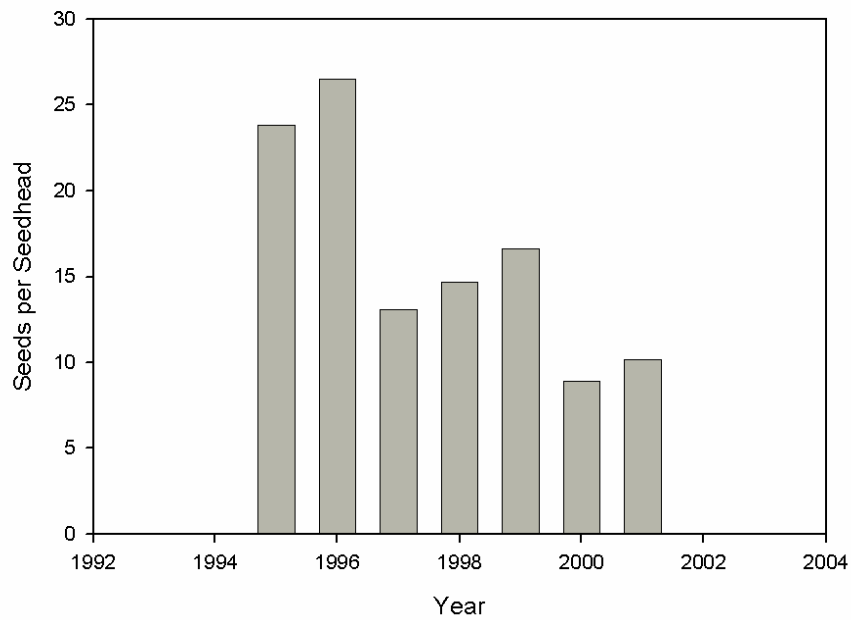


Figure 2. Mean seed production of yellow starthistle seedheads

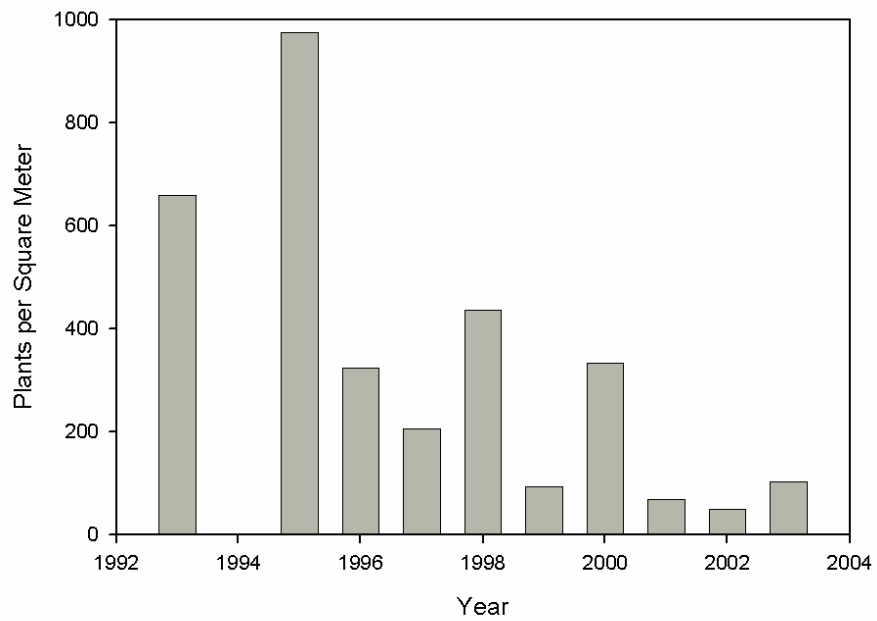


Figure 3. Density of yellow starthistle at Yolo County biological control site